

Estimation of Incidental Takes of Blackfooted and Laysan Albatross in the Hawaii Longline Fishery during 2001

Annual and quarterly point estimates of the total incidental take of blackfooted and Laysan albatrosses in the Hawaii longline fishery have been computed for calendar year 2001 (Table 1). Two regulatory regimes were in effect during 2001 and 2002. The first regime governed Hawaii longline fishing from 25 August 2000 through 31 March 2001 and therefore was applicable during the first quarter of 2001. The second regulatory regime began on 1 April 2001 and continued into mid-2002 and was applicable during the last three quarters of 2001 and the first two quarters of 2002. The regulations under the two regimes were:

Regime 1: Fishing grounds were split into three areas with different restrictions. Area A, defined as the area bounded by 28°N and 44°N latitude and 168°W and 150°W longitude, was closed to fishing. Area B was defined as the area between 28°N and 44°N latitude and consisted of two regions east and west of Area A, from 173°E to 168°W longitude and 150°W to 137°W longitude. In Area B, effort was restricted and all vessels were required to carry a NMFS observer when fishing in the area. Area C was defined as the area south of 28°N latitude extending to the equator and between 173°E and 137°W longitude. Hawaii-based longline vessels were prohibited from targeting swordfish in this area.

Regime 2: Fishing was regulated by a NMFS interim rule implementing the 30 March 2001 order of the U.S. District Court in Honolulu. Specific aspects of the rule can be found in the Federal Register, Vol. 66, No. 113. In summary, the rule prohibited Hawaiian longline vessels from fishing with longline gear during the months of April and May in the area bounded on the south by the equator, on the west by 180° longitude, on the east by 145°W longitude, and on the north by 15°N latitude. The rule also prohibited targeting of swordfish and carrying light sticks, among other measures. Furthermore, Hawaii longline vessels were required to deploy longline gear in such a way that the sag (deepest point) between any two floats was at least 100 m beneath the sea surface, and the float line suspending the main longline beneath a float was at least 20 m long, with a minimum of 15 branch lines deployed between any two adjacent floats. Although the NMFS rule was not published until 12 June 2001, information provided in the logbooks indicates that the regulations were respected from the date of the court's order.

In addition to the estimates of take for calendar year 2001, estimates of the take occurring during the interval of the first regulatory regime (slightly over 6 months) and a full year of the second regulatory regime (1 July 2001 to 30 June 2002) were calculated (Table 2).

Because these two time periods represented two distinct phases of management in the fishery, the data were treated separately by regime. For the first regime, the estimate of total take was derived

using the modeling approach used in previous years (McCracken 2001). Since the restrictions in Regime 1 were implemented on 25 August 2000, data from the NMFS observer program collected from 25 August 2000 through 31 March 2001 were used to build the models to predict the take by species for the first quarter of the year 2001.

Despite higher observer coverage in 2001 and 2002 than in previous years, the paucity of interactions with seabirds during the second regulatory regime required a different statistical approach than the modeling approach to estimate total take. The number of seabirds taken on a longline set is expected to show a seasonal and spatial trend corresponding to the nesting season and distribution of seabirds; however, there are not enough observed takes to model these trends.

An alternative method for estimating total take is to base the estimator on the sampling probabilities that a trip was sampled. Strictly speaking, we do not have a probability sample because not all trips during the period of concern had a probability greater than zero of being sampled. Although trips were typically selected by a random scheme, it is unrealistic to assume that each trip had an equal probability of being sampled. When modeling the probability a trip had an observer on board, a reasonable model suggested splitting the period into four strata and assuming equal probability within each stratum. Therefore, we computed the total take during the second regime assuming a stratified random sample with simple random sampling without replacement in each of the four strata. Although the estimators used are unbiased under this assumption, we have approximated the sampling probabilities and are not under the pretense that our estimators are unbiased. Because of the rarity and distribution of bycatch, it is not clear how to derive a confidence interval; therefore, only standard errors are provided.

For practical reasons, it is difficult to draw a sample of fishing trips with known sampling probabilities. Changes have recently been made to the NMFS procedures for selection of observed fishing trips so that a probability sample, or closely approximate, is obtained. Furthermore, sampling records are being kept so that sampling probabilities can be computed.

McCracken, M. L. (2000). Estimation of albatross take in the Hawaiian longline fisheries. Honolulu Lab., Southwest Fish. Sci. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Southwest Fish. Sci. Cent. Adim. Rep. H-01-03. 29 p.

Table 1. Estimates of the total incidental take of blackfooted and Laysan albatross in the Hawaii-based longline fishery during 2001.

Species	Quarter 1	Quarter 2, 3, and 4	Total
	Take	Take	Take
Blackfooted	215 (s.e.=26.08)	43 (s.e.=18.34)	258
Laysan	145 (s.e.=21.30)	107 (s.e.=90.68)	252

Table 2. Estimates of the total incidental take of blackfooted and Laysan albatross in the Hawaii-based longline fishery during two recent regulatory periods. For Regime 2 since it was unclear how to compute a 95% confidence interval, only the standard error of the estimate is provided.

Species	Regime 1	Regime 2
	25 August 2000 - 31 March 2001	1 July 2001 - 30 June 2002
Blackfooted	272 (95% P. I. [212-373])	58 (s.e.=15.79)
Laysan	155 (95% P. I. [108-216])	62 (s.e.=18.44)